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Title: Possible Continuous Production Plans

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Possible Continuous Production Plans

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Assumed Defect Rates – Fixed Lot

	Confidence Level	Total Number	Time Period (Years)	Total Number Tested	Test Plan	Useful Number	Defect Rate Limit				Total Tested
Current Fixed Lot	99%	3250	5	5x(40+138)	Random within Period	2360	0.43%				890
	99%	650	1	40+138	Random within Period	472	2.19%				178
	99.9%	3250	5	5x(40+138)	Random within Period	2360	0.66%				890
	99.9%	650	1	40+138	Random within Period	472	3.27%				178

If there are zero failures observed in the testing then
one can be 99% confident that there are less than 0.43% defects in the population of 3250 items.

Possible Continuous Initial Plan

	Confidence Level	Total Number	Time Period (Years)	Initial Number Tested	Test 1 of Every (Randomly)	Useful Number	Post Defect Rate Limit	Post Tested	Total Tested	Untested after Initial		Post Tested	Total Tested
	99%	650	1	178	472	471	2.18%	1	179	472		1	179
	99%	650	1	40	4	457	2.00%	153	193	610		153	193
Continuous Production Plans	99%	650	1	178	472	471	2.18%	1	179	472		1	179
	99%	650	1	40	7	522	3.20%	88	128	610		88	128
	99.9%	650	1	178	472	471	3.25%	1	179	472		1	179
	99.9%	650	1	40	5	488	3.64%	122	162	610		122	162
	99.9%	650	1	178	472	471	3.25%	1	179	472		1	179
	99.9%	650	1	40	7	522	4.73%	88	128	610		88	128

1. The “Post Defect Rate Limit” percent defect numbers are after all units are created and tested while assuming no failures are observed.
2. One important message is: Assuming uniformity of the “batch”, which we assume in the fixed lot case anyway, the actual defect rate is lower or the confidence level is higher as the items are produced. This is because the initial number tested is at the beginning of the process giving very high confidence or lower defect rates to the first and subsequent items produced.
3. It is also important to realize that we are not “testing in” quality. It is not the testing that produces the zero failures. The testing is more of a crude process change detection. Continuous sampling and testing is more likely to catch any such quality changes in near real time rather than waiting for the lot to be produced and then testing. Because we do not test first this does not change the quality of the items. As long as the same procedures are followed to make the items the quality is the same.

Possible Continuous Frequent Testing Plan

	Confidence Level	Total Number	Time Period (Years)	Initial Number Tested	Test 1 of Every (Randomly)	Useful Number	Post Defect Rate Limit	Post Tested	Total Tested	Untested after Initial		Post Tested	Total Tested
	99%	3250	5	178	5	2457	0.51%	615	793	3072		615	793
	99%	3250	5	178	3	2048	0.31%	1024	1202	3072		1024	1202
	99%	3250	5	40	4	2407	0.47%	803	843	3210		803	843
Continuous Production Plans	99%	3250	5	40	2	1605	0.20%	1605	1645	3210		1605	1645
	99.9%	3250	5	178	5	2457	0.76%	615	793	3072		615	793
	99.9%	3250	5	178	3	2048	0.46%	1024	1202	3072		1024	1202
	99.9%	3250	5	40	4	2407	0.71%	803	843	3210		803	843
	99.9%	3250	5	40	2	1605	0.30%	1605	1645	3210		1605	1645

1. “We sure don’t want to be test firing 1 out of every 3 to 5,” D. Kolman.

Possible Continuous Plan Matching Rates

	Confidence Level	Total Number	Time Period (Years)	Initial Number Tested	Test 1 of Every (Randomly)	Useful Number	Post Defect Rate Limit	Post Tested	Total Tested	Untested after Initial		Post Tested	Total Tested
	99%	650	1	120	120	525	3.27%	5	125	530		5	125
	99%	650	1	120	9	471	2.18%	59	179	530		59	179
	99%	650	1	100	22	525	3.27%	25	125	550		25	125
Continuous Production Plans	99%	650	1	100	7	471	2.18%	79	179	550		79	179
	99.9%	650	1	120	9	471	3.26%	59	179	530		59	179
	99.9%	650	1	120	4	397	2.14%	133	253	530		133	253
	99.9%	650	1	100	7	471	3.27%	79	179	550		79	179
	99.9%	650	1	100	4	412	2.31%	138	238	550		138	238

1. Assume the 2.19% and 3.27% defect rates.
2. And that would give you the same defect rate as currently planned if we had a full lot.

Possible Continuous Plan Similar Rates

	Confidence Level	Total Number	Time Period (Years)	Initial Number Tested	Test 1 of Every (Randomly)	Useful Number	Post Defect Rate Limit	Post Tested	Total Tested	Untested after Initial		Post Tested	Total Tested
	99%	650	1	120	40	516	3.04%	14	134	530		14	134
	99%	650	1	120	20	503	2.74%	27	147	530		27	147
Continuous	99%	650	1	100	40	536	3.64%	14	114	550		14	114
Production	99%	650	1	100	20	522	3.20%	28	128	550		28	128
Plans	99.9%	650	1	120	25	508	4.23%	22	142	530		22	142
	99.9%	650	1	120	10	477	3.38%	53	173	530		53	173
	99.9%	650	1	100	25	528	5.00%	22	122	550		22	122
	99.9%	650	1	100	10	495	3.83%	55	155	550		55	155

1. Rates are focused on being near the 2.19% and 3.27% defect rates.
2. With 99% and 99.9% confidence.

High Quality Processes

- LANL is the brand
- If the quality is high then we cannot learn much by testing
- Think of the item quality as coming from brand quality plus lot quality
  - A history of no defects should not be ignored - brand
  - We could formalize this by formal statistical methods